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BUILDING CHINA'S OWN MINING EQUIPMENT-- PRESENT MANUFACTURING STANDARDS NOT SUITED TO MEET DEMANDS

Superiority in mining equipment plays an important part in the improvement of labor productivity and in the development of mining and production. The speed of development in various industries depends on the supply of raw materials and fuels. Therefore, the rate of development of mining equipment affects the rate of development of the entire economy.

China started on its third 5 year plan from this year, but the policy of "placing importance in machine designs for mining and agriculture and planning for a large volume of practical and highly efficient mining and agricultural machines" was already established in December 1965 when the National Machine Products and Design Council meeting was held (NCNA, 21 Dec 1965). A conference of various industrial departments of the government held in April 1966 decided that China will start producing new and highly efficient mining facilities and equipment and also design and produce over 100 types of mining equipment suitable for mining conditions in China (NCNA, 8 Apr 1966).

Machine Facilities Fitted to Mining Conditions of China

China began placing importance on mining and production of mining facilities after the liberation. Mechanization of mines developed rapidly since then. For example, mechanization of modern mines in China increased from 77.64% in 1952 to 94% in 1957. During the same period, the use of face conveyor increased from 69.62% to 92.02%, mechanization of main shaft transportation increased from

77.9% to 85.04% and the mechanization of train loading increased from 65.16% to 90.78%. A most recent hydraulic mining was introduced in 1956.

However, in the past, the researchers and cadres of mine equipement manufacturing plants hardly visited the mines to conduct researches. They considered mining equipment to be relatively simple and required very little technical knew how. Technicians of these days introduced or copied foreign made equipment which, in many cases, did not suit the mining situations existing in China (NCNA, 8 April 1966).

In November 1964, Mao Tse-tung appealed for a mass design revolution and showed a right direction toward a development of mining machineries. Cadres and designers started to carry out researches at the mines. For example, a researcher of Shanghai Machine Institute, Institute of Scientific Research of Coal, Ministry of Coal Industry carried out an operation method of "design and plan at mines, manufacture at plants and test at mines."

Many new and highly efficient mining facilities and machineries developed through the design revolution movement conform to the natural mining conditions of China . Some of the machines include thin layer coal mining combine, multi wire hoist, piercing drill, rock drill of high efficiency, large rock loader and strong magnetic ore separator.

There still exists a gap between the manufacture standard of mining equipment and the actual demand. It is said that manufacturing departments have decided to establish China's own mining machineries system as early as possible (NCNA, 8 April 1966).

The following are some of the mining facilities.

Hydraulic Mining Facility

China introduced a Soviet method of hydraulic mining in 1956. It proved superior to the dry method of mining; therefore, the emphasis was placed on the development of hydraulic mining techniques. In 1957, hydraulic mining produced 720,000 tons of coal and increased to 1,670,000 tons in 1958, to 8,000,000 tons in 1959 and to 16,000,000 (planned) in 1960. There is no subsequent figures given, but it is reported that the largest coal mine at Fu-shun has been equipped with hydraulic mining system in 1965 (NCNA, 8 Oct 1965).

The hydraulic mining facility used at Fu-shun Coal Mines was studied and tested by the Fu-shun Mining Affairs Bureau, T'ang-shan Coal Scientific Institute and the related manufacturing group. This facility is made up of main pump, draft tube, coal ejector tube and tank type coaling machine. It uses water pressure which is capable of bringing up 100 tons of coal from a mine 600 meters deep every hour. It is also able to convey coal lumps of up to 120 mm in diameter and at the same time able to sort according to size and remove the refuse.

It is said that Fu-shun Coal Mines is using a flexible conveyor belt for coals operated by a water pressure. This conveyor can be brought right up to the working face and said to be twice as efficient as an ordinary conveyor.

Mining Combine

There were only two or three types of ineffective and simple mining combines in China and most of the mining was carried out manually. Chinese first

thin layer (or shallow layer) coal mining combine was developed and manufactured. This combine is capable of mining, loading, transporting, supporting shaft and moving conveyor. It is a set made up of various machines. It was proven that this type of combine is two or three times more efficient than the previously used combines. The labor force was cut into half and the degree of physical labor was lightened.

However, this combine is effective only in area of gradual sloping medium thick coal stratum; therefore, it is reported that these concerned are designing and testing new mining combines which can be used in other types of coal strata (NCNA, 8 April 1966).

Handy Cutter-Leader

The handy cutter-leader invented by workers of Ta-t'ung Coal Mines in northern China and placed into operation in 1965 proved to be very efficient. Only few men are needed to operate this machine which automatically mines and loads onto conveyor and coals are brought to surface by coal cars. This machine's degree of progress is 120- 180 meters per hour (NCNA, 14 Oct 1965).

Rock Drill

Shenyang Pneumatic Tools Plant successfully test produced eleven new types of rock drills during 1965. Out of these, six are used exclusively inside the mines. These drills range in weight from 18kg to 30kg and varies from high frequency drill for hard coal strata to dust catching drills for dry areas.

There are also light weight drills for drilling small holes and special drills for both open pit and underground mining.

Drills for open pit mines designed by the Mining Institute of Anshan Steel Company were successfully test manufactured in 1965. Most of the open pit mines in China have graduated inclines. The foreign type drills are good for vertical drilling only and are very slow. Blasting is not too effective and often requires second blasting. However, the new drill is able to drill at 45° to 90° which makes blasting more effective and breaks coal into a more uniform lumps. This angle blasting reduces the reject coal by 10% and eliminates the second blasting. This new rock drill also eliminated the use of water in drilling (NCNA, 25 Jan 1965).

A new rock drill support with automatic adjuster was test manufactured in Shensi in 1965. This support is called the T'ung 51-1. It is more versatile, lighter and more effective than the older models. The cost is only 40% of the previously produced models. The Chinese copied the foreign made 72-12 type in the past but this type has shorter stroke, less propulsion and not as versatile. The foreign type also required two men to adjust two or three times during each drilling, but the new T'ung 51-1 model is self adjusting (NCNA, 25 Aug 1965).

Boring Machine

The Peiping Mining Machine Plant has been mass producing XJ 100-1 type boring machines since 1965. This machine was designed to meet the demand for shallow drilling of up to 100 meters. A set of this machine comprised of borer, pump and diesel engine. A set can be assembled and put into operation in 30

minutes by 6 men and the mechanical and manual feed controlling devices can be interchanged freely. A rotary and hoist machines are three speed which improve the boring effectiveness (NCNA 27 Aug 1965).

In 1964, the Chang-chia-k'ou Deep Coal Mining Machines Plant in Hopeh started a mass production of machines capable of boring up to 1000 meters.

Conveyor

A flexible conveyor and a cable type belt conveyor are two of the new conveyors.

A heavy flexible scraper-conveyor is being used at the Fan-ko-chuang pit at Kaifan [phonetic] Mine. Yin Chi-ch'ang, an engineer at Fan-ko-chuang pit, said that " this new conveyor has a large loading capacity, is strong and durable, has very little trouble, design and quality very good." This is one of the new products of the Chang-chia k'ou Mining Machines Plant and is now being mass produced (NCNA 9 Nov 1965).

The Fu-shun Mine is using a flexible conveyor system operated by a water pressure. This type can be installed very close to the working face of a mine and the transporting capacity is almost double that of an ordinary conveyor (NCNA 8 Oct 1965).

In 1965, the Huai-nan Mining Equipment Plant manufactured a cable type belt conveyor with the cooperation of Peiping Academy of Mining and Shanghai Institute of Mining Equipment Research of the Academy of Coal Sciences. Tests conducted at Huai-nan and Kairan [phonetic] Mines proved that it performed satis-

facterily. A belt of 800 mm wide and 300 meter long is capable of transporting 350 tons per hour. The structure of this cable type belt conveyor is very simple. Cables can be attached to mine supports and over belt pulleys. It is easy to install and convenient to adjust and maintain (NCNA 13 Jul 1965).

Mining Use Leaders

A wide use machine plant in Ch'ing-hai (Tsinghai) Province succeeded in test manufacture of ore loading machine in 1965 and started on a mass production. A capacity of a bucket of this machine is 0.25 m^3 capable of loading 35 to 45 m^3 of ores per hour. This machine is superior in construction to the foreign make and many of the vital parts are more resistant to wear (NCNA 8 March 1965).

Coal Dressing Method- Coal Dressing Machine

The Feu-hsin-hai-chou Open Pit Coal Dressing Plant adopted a most recent heavy liquid coal dressing method in place of a manually operated method. In the manual method, laborers stood on both sides of a conveyor to take out the refuse. Each man had to clean out 10 to 13 tons of refuse during each working period. The work was very hard and the coal dust was detrimental to workers health. However, the use of heavy liquid coal dressing machines mechanized the operation and made the coal almost free of refuse. The ratio of coal in refuse was lowered from 12 to 1,000 to 3 to 1,000. In the heavy liquid dressing method, magnetite powder is mixed in water until it reaches a designated specific gravi-

ty and this mixture is placed in the dressing machine. A specific gravity of suspension is between specific gravity of coal and refuse. When coals pass through the dressing machine, coals float on suspension and a jig is used and transported by coal tubs after being dried. The refuse settles to the bottom and transported away in refuse tubs after water has been shakened off (NCNA, 10 Jan 1966).

Shenyang Mining Equipment Plant succeeded in manufacture of highly magnetic ore separator. A mass production of this machine is expected to start this year (NCNA 8 April 1966).

The Institute of Mining and Metallurgy of the Chinese Academy of Sciences has completed researches on heavy liquid circulating tin ore dressing four layer spring and table, inclined density machine, fan shape tank and tin ore floating dressing facility within a year. (Kuang-ming Jih-pao, 14 Apr 1966)

New Air Compresser for Mining

An air compresser usable in coal mines was manufactured by the Shenyang Gas Compresser Plant in early 1966. This is the first time a compresser of this type was produced in China. It is compact and easy to operate. Formerly, compressed air was sent through a pipe of 1,000 to 2,000 meters long. This new compresser cut the pipe length to about 100 meters. It is equipped with automatic controls and safety features. Whenever there is a lack of water or oil and the compresser becomes too hot, the compresser steps automatically. (NCNA 15 Jan 1966)

Concrete Blower

Concrete blower, a new device for construction of mining tunnels, was successfully test manufactured recently through a cooperative efforts of the Research Academy of Construction of the Ministry of Metallurgical Industry, No.3 Metallurgical Construction Company and the No. 4 Mining Company. All permanent type mines are being reinforced with concrete, pre-cast concrete blocks and with pre-cast ferro concrete , but this requires time and the work is complicated which interferes with the mining operation.

The newly developed concrete blower eliminates most of the defects and the concrete can be blown on more securely with compressed air. A blown concrete of same consistency is 1.5 to 5 times stronger and firms much faster.

This method of covering work in tunnels save 40 - 50% of lumber and concrete and cut down the labor force by one-half or one-third. The work can be completed 3.5 to 4.5 times faster and the cost can be reduced by 50%. This method is now being applied in new mines (NCNA, 11 Apr 1966).

Small Mortar Mixer for Mines

P'ing-ting-shan Mine in Honan Province achieved good results in the use of mortar mixer (or agitator) in the construction of mines. A bag of cement requires 10 to 15 minutes of mixing by two men but the mortar mixer can do the same work in 3-4 minutes with only one man (NCNA, 20 Jul 1965).

Supervisory Signal Panel

A supervisory signal panel is used in giving production commands at four mines in P'ing-ting-shan Mines in Henan Province. All commands in the past were given over telephones installed at various coverns, work shops, mining areas and at working faces. An overall production picture was obtained only by looking at various charts. Since the use of supervisory signal panel started, operations of facilities and general production conditions can be grasped from signal lights, electric clocks and bells. Commands to all parts of the mines can be given at any time through a carrier telephone (NCNA, 20 July 1965).

Safety Devices

A great effort is given in production safety and accident prevention. Some of the new products for safety are as given below.

High voltage leak relay:

A high voltage leakage inside a mine may cause explosion. In order to prevent this, an automatic device called the high voltage leak relay was developed by the A-ch'eng Relay Plant in Heilungkiang in 1965. A test was conducted at the Huai-nan Coal Mine proved that this protective relay device using a new semi-conductor techniques was very good.(NCNA, 5 Oct 1965)

Gas Automatic Alarm:

Chung-liang-shan Coal Mine in Chungking produced an automatic gas warning device. This device is placed in an exhaust room. A rubber tube attached to the device is able to detect the changes in gas flow. Whenever a gas flow exceeds

a danger point, a red light appears so that a person in charge can take a proper measure to prevent any accident (NCNA, 6 Mar 1966).

Multiplying air machine foam fire extinguishing method:

The No.2 Laboratory of the Fushun Coal Institute succeeded in testing a method using foams to extinguish fires after six years of work. It is possible to extinguish a fire in a mine from a distance of up to 100 meters away which ensures safety of workers. This method is now being used in P'ing-ting-shan, Fou-hsin, Fu-shun and other mines are already using this method.

The No.2 Laboratory started on the new fire extinguishing techniques in 1958. They collected over twenty types of foaming materials and decided on the cheapest, highest performing and high moisture content foaming agent. They built a revolving leaf type foam nozzle and a spindle shape discharging net. This discharger produces over 100 m^3 of foams per minute. It is able to put out a raging fire in 20 - 30 minutes. The only drawback of this equipment is that it is quite heavy (NCNA, 28 Jan 1966).

In addition to above, the Wuhan Metallurgical Safety Technique Institute developed a new type of anti-dust atomizer to guarantee against explosion and a explosion velocity measuring instrument to improve the blasting efficiency.

Water blast exhaust device, various drills with moist or dry dust absorbers [or exhaust] and filtering techniques are being taken up to cope with the coal dust situation. A test on photo-electric and static electric dust measuring devices are being carried out.

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RECENT BASIC CONSTRUCTION AND TECHNICAL REVOLUTION IN CHINESE COAL MINING

/Following is a translation of an unsigned article in the Japanese-language semimonthly publication of the Ajiya Tsushin Sha (Asia News Service), Chugoku Sangyo Shashin Tsushin (Photos and Features on Chinese Industry), No. 63, Tokyo, 1 March 1966./

At the invitation of the Japan-China Trade Promotion Association, a Chinese coal delegation will soon come to Japan. Items in which this delegation is interested are (1) mining techniques and machinery, (2) technical exchange concerning coal mine construction, vertical shaft construction, and waterproof construction, and (3) coal-dressing technology and equipment, and centered on these, the plan is said to be to inspect Japan's coal mines and mining machinery plants. Therefore, on this occasion in this paper, let us explore new trends in such things as China's most recent coal-mining construction, technology, and equipment.

Recent Basic Construction

Basic construction of coal mines in China has steadily advanced, and each year new pits are completed and put into production, and from the end of last year into this year, news of the beginning of coal production at new pits has been reported several times. If those are listed, they are as follows.

Kirin Province Tunghua Mining Affairs Bureau New Pit - All production processes at this pit are mechanized from coal mining to carrying away, and it can produce 450,000 tons of coal per year (New China News Agency Changchun dispatch, 7 January 1966).

Shansi Province Yangchuan Peitoutsui Ssuchih Coal Mine New Pit - The annual production capacity of this pit is 450,000 tons, and production processes are all mechanized from coal mining to transportation. Also, a coal-dressing plant is attached to the pit (New China News Agency Taiyuan dispatch, 27 December 1965).

Shansi Province Fenkao Coal Field Shuiyu Pit - This is a modern large-sized pit with an annual production capacity of 900,000 tons of basic coal. It was designed by China itself and the mechanized equipment is completely domestically produced. The workers who built this large-sized pit carried out the principle throughout the entire construction process of firmly combining revolutionary enthusiasm with a scientific attitude, and greatly breaking through the framework of foreign dogma and convention, they conducted technical revolution and scientific experimentation, aiming for first-rate quality. Strict inspection has proved that the quality of drift work at this pit as well as transportation facilities, machine and electrical equipment, ventilation and drainage facilities, and construction installation works all reached specified standards (New China News Agency Taiyuan dispatch, 11 February 1966).

Anhwei Province Huaipei Mining District Huanghouyao Pit - This is a pit of quite high mechanization with an annual production of 600,000 tons of basic coal and it was designed and put into operation by the Huatung Coal Industry Company Basic Construction Company. All machine equipment of the pit was manufactured by related plants in China (New China News Agency Hofei dispatch, 17 January 1966).

Szechwan Province Several Tens of Small-Sized Coal Mine Constructions - New Construction of 57 small coal mines and technical reconstruction of 29 is being advanced in Szechwan Province at present. When these are completely in operation, an annual production of more than 3,300,000 tons of coal will be possible, which is approximately half of the annual amount of coal produced at present in the Szechwan district coal mines. Most of these small coal mines are distributed in the central part of Szechwan which has little fuel as well as along rail lines of comparatively convenient transport and on both banks of rivers. These districts are Szechwan Province's food and economic products producing areas and are districts in which handicrafts, small chemical fertilizer plants, small sugar refineries, and other plants processing secondary agricultural products are relatively concentrated. Heretofore, these districts have depended on large and medium-sized mines and other coal-mining regions for all of their coal supply. When these small coal mines are completed, this situation will gradually change and it will become possible to obtain the coal supply locally.

Recent Technical Revolutions

As seen above, in China's coal mines, even now new pits are being put into production one after the other, and it presents a remarkable contrast to Japan and Western countries where they are being closed one after the other with coal as a declining industry, and technical innovations are steadily being advanced even in old coal mines which are being exploited. Below, let us consider recent principal coal-mine technical innovations.

Fouhsin Haichou Open-Pit Coal Mine Coal-Washing Plant Heavy Fluid Coal-Dressing Method

This is said to be a coal-dressing method greatly superior to former human coal-dressing methods, and the operation process is to first mix together iron filings and water and make a suspension of a certain specific gravity, and putting this in the ore separator, from that passes coal mixed with butter. The specific gravity of the suspension is between the specific gravity of coal and butter, and when the coal passes through the ore separator, it floats up, and after it is screened and dehydrated it is put in coal cars. When the butter passes through the ore separator it naturally settles, and after it has been dehydrated with the dehydration screen, it is discarded in the butter cars.

This coal-dressing method is exceptionally superior to human dressing methods. In the case of previous human coal-dressing, workers stand on both sides of the conveyor belt and sort out the butter, and one person must sort out from 10 to 13 tons in one shift, work intensity being great, and also, since the lumps of coal strike against each other on the belt, coal dust rises in the room, which is also bad for the health of workers. After adopting the heavy fluid coal-dressing method, human coal dressing was completely taken over by machine, and moreover, efficiency of coal dressing greatly increased from the time of manual labor and butter content of the carefully selected coal approaches zero, and also the coal content of the butter is lowered from the former 12 parts per thousand to 3 parts per thousand.

This heavy fluid coal dressing method which was adopted by the Haichou Open-Pit Coal Mine was successfully experimented upon with assistance of the Peking Mining College.

Fushun Coal Mine Hydraulic Hoisting System

At the Fushun Coal Mine, which is China's largest coal mine, a new hydraulic hoisting system has been introduced which is believed to be quite important for deep-strata coal mining. Compared with the winch multi-stage hoisting system which was heretofore adopted by the same mine, the new hoisting system can reduce personnel by 50 percent, can greatly reduce labor intensity of workers, and can transport 100 tons of coal to the surface per hour from a pit 600 meters below the ground. This new hoisting system is comprised of such things as a main pump, suction pipes, coal removal pipes, and tank-type coaling machines, and utilizing water pressure, lumps of coal up to 120 millimeters in diameter can be carried up to the surface from a pit bottom of a depth of 600 meters. This also performs the work of a coal-dressing machine, and when the coal is brought out from the pit, the lumps of coal are automatically separated from the butter, the large lumps of coal coming up first, and next are brought up medium and small lumps of coal, and finally, the butter and coal mud are also brought to the surface.

This hydraulic hoisting system was successfully researched and experimented with jointly by the Fushun Mining Affairs Bureau and the

Tangshan Coal Scientific Research Institute as well as related manufacturing departments. Also, technicians and workers of the Fushun Coal Mine created a flexible coal conveyor which can be operated by means of water power, and this slack coal conveyor can pull up close to the coal face and is said to be able to carry twice as much as ordinary conveyors, and this equipment is also seen as a powerful link in raising the efficiency of the hydraulic hoisting system.

Rope-Mounted-Type Belt Conveyor Manufactured at Huainan and Heavy Model Flexible Scraper Conveyor Manufactured at Chiangchiakou

In coal transportation equipment, new belt conveyors have been manufactured and are being used in various coal mines. One of those is the rope-mounted-type belt conveyor manufactured by the Huainan Mining Machinery Plant in cooperation with the Peking Mining College and the Coal Scientific Research Institute Shanghai Coal Mine Machinery Research Institute. The structure of this conveyor is simple, and the steel rope may be hung on the shaft supports to support the conveyor belt wheels, and installation and moving are both convenient, adjustments can be quickly made, and maintenance care does not require much labor. Having been experimentally used on the ground at the Huainan Coal Mine as well as in shafts of the Kailuan Coal Mine, efficiency of this new conveyor has been demonstrated to be good. The belt used in this is 800 millimeters wide and can carry 350 tons of coal 300 meters in one hour, and it is said to remarkably increase transport capability as compared with conveyors presently widely used near coal faces in shafts of China's coal mines.

Another new-model conveyor is the heavy-model flexible scraper conveyor which is a new product of the Chiangchiakou Coal Mining Machinery Plant. The greater part of those used previously in China at coal mine faces were inflexible scraper conveyors, and these had defects such as that the amount of transported coal was small, and they were easily damaged and troublesome to move. This new flexible conveyor was used at the coal face of the Kailuan Coal Mine Fanlochuang pit in the fall of last year, and Chief Engineer Yin Chi-chang of the Fanlochuang pit said, "The coal-carrying capacity of this new-model conveyor is great, it is strong and durable, troubles are few, and the quality of design and construction are quite high." The Changchiakou Coal Mine Machinery Plant has already entered into quantity production of this conveyor.

Tatung Coal Mine Convenient Cutter-Loader

The Tatung Coal Mine is the most highly mechanized coal mine in China. Last year, 261 items of technical innovation proposed by workers and technicians of the mine were put into use, all of them being related to reduction of physical labor, and one of those, the convenient cutter-loader which was put into use last year and was devised by workers, has been proved to be very effective in all pits of the Tatung Coal Mine.

This cutter-loader advances at the rate of 120 to 180 meters per hour. At the Meiyukou coal pit which is the most highly mechanized pit at the Tatung Coal Mine, only a few workers do manual labor at the coal face. They are only assigned to the cutter-loader, and the cutter-loader automatically mines the coal and loads the coal on the conveyor belt, and from there the coal is carried out by coal car to the surface. Thus, the entire work at the Meiyukou pit, excepting the work of timbering, is mechanized, and at the entire Tatung Coal Mine, 80 percent of coal mining operations are mechanized.

Pingtingshan Coal Mine Signal Surveillance Board and Small-Sized Mixer for Use Within the Mine

At the Honan Province Pingtingshan No. 4 Mine, a signal surveillance board is used. The appearance of this important technical innovation from the point of view of coal mine production supervision has greatly raised the level of superintendence operations at the Pingtingshan No. 4 Mine. This signal surveillance board was successfully manufactured by eight graduates of the Peking Mining College specializing in mining machinery and electricity when they did practical work at the Pingtingshan No. 4 Mine together with workers.

Mine command personnel of the Pingtingshan Coal Mine have heretofore, for the purpose of understanding and controlling the production situation, depended completely on telephone communication with such things as cave rooms in the mine, workshops, coal mining districts, and coal faces, and the command personnel were extremely busy with telephone calls, records, and replies. At the same time, in order to grasp the overall production situation it was necessary to depend on many diagrams. However now, with use of the signal surveillance board, command personnel can understand and grasp the facilities operation situation and the general production situation both inside and outside the mine by means of the indications of signal lights, electric clocks, and electric bells, and using portable telephones, they can at all times control transportation within and without the mine and can make command operations more timely and correct, and make production more safe.

At the Pingtingshan Coal Mine, also in shaft construction, a small-sized convenient tool - a mixer for use inside the mine - is used, and is regarded highly by the coal industry. This is a mechanization of mortar mixing which had heretofore depended completely on physical labor, and as the result of more than three months of on-the-spot experimentation, its efficiency is considered to be good. Formerly, 10 to 15 minutes were required for two persons to mix one bag of cement, but this machine is operated by one person and can mix it in three to four minutes. Labor intensity of workers is greatly reduced, the quality of mortar increases, and loss of cement is lessened.

This mortar mixer for use inside the mine was successfully trial-manufactured by workers and technicians together with strong support of the mine leadership and with guidance of instructors at the time 1965 graduates of the Peking Mining College specializing in coal mine construction did their graduation projects. The coal-mining industry

attaches much importance to the completion of the mortar mixer for use inside mines, and it has already begun to be disseminated to other coal mines.

New-Model Air Compressor for Coal Mine Use Manufactured in Shenyang

Manufacture by the Shenyang Air Compressor Plant of a new-model air compressor used in coal mines will also be noted. This compressor was produced for the first time in China and was designed and manufactured on the basis of requirements of the Chinese coal industry and conditions of use in the mines. Previously, compressors used in Chinese coal mines were voluminous and were therefore generally placed outside outside the mine, but the structure of this new-model air compressor is small and well-made and very convenient in installation, operation, and movement. When compressed air is sent by it, the pipe which was previously 1,000 to 2,000 meters can be shortened to about 100 meters. For the purpose of conforming to special requirements of production within the mines, this compressor has various kinds of automatic control and safety equipment and it automatically stops when water or oil are lacking or when the temperature of the machine rises above a prescribed amount.

Automatic Equipment for Preventing Electric Leakage Accidents in Mines -- High-Voltage Electric Leakage Relay

When high-voltage cables inside a coal mine leak electricity, explosiom accidents of gas or coal dust occur, and the high-voltage electric leakage relay which is automatic equipment which can effectively prevent these accidents has been manufactured at the Acheng Relay Plant in Heilungkiang Province. This is a protective relay using a semiconductor technique, and having been experimentally used inside the Anhwei Province Huainan Coal Mine, it has been demonstrated that its effectiveness is good. In the experimentation process in this mine, five high-voltage cable electric leakages occurred, and the automatic equipment very responsively cut off the power source and prevented an accident in the mine. Thus, many of the coal mine workers danced for joy and said that since the state manufactured such wonderful new equipment, work in the mine had become safer.

Insulated monitors had previously been used in Chinese coal mines in control of high-voltage electric leakage. With this equipment, when electric leakage occurred in any line alarms were simultaneously sounded, and when at that time it was tried to eliminate the difficulty, they would inspect cables one by one or turn on the oil switches one by one and had to seek the trouble point by the method of complete power stoppage. However, when the newly-made high-voltage electric leakage relay is used, wherever the electric leakage occurs, the power source of that place is immediately controlled and other cables work as before. In the process of designing and trial-manufacturing this high-voltage electric leakage relay, the Acheng Relay Plant gained the cooperation of the Shenyang

Coal Mine Design Institute, the Hofei Industrial University, as well as coal mines of Hokang, Fushun, and Huainan.

High-Multiplying Air Machine Foam Fire-Extinguishing Method

In the field of preventing disastrous accidents in coal mines, the successful test of a high-multiplying air machine foam fire-extinguishing method at the end of more than six years of endeavor at the no. 2 laboratory of the Fushun Coal Research Institute will be noted. Large fires are apt to break out in coal mines, and when these cannot be put out, generally the method has been used of sealing off the fire area, but when this high-multiplying air machine foam fire-extinguishing method is used, fire-fighting personnel can conduct fire-fighting from a safe position several tens of meters to 100 meters away from the fire location, and under certain conditions the speed of putting out the fire is fast, the power is great, and effectiveness good. Research of this new technique of fire-fighting was begun in 1958, the first step of the research being to select a foam material of good efficiency. At the end of three to four years of endeavor, more than 20 kinds of foam raw materials were gathered from the entire country, and from these, foam materials of low price, good efficiency, and high water content were selected and mixed. The researchers continuously endeavored, and made a revolving-leaf-type foam nozzle and a plumb-shape string firing net. When this foam ejector is used, the amount of foam produced in one minute reaches more than 100 cubic meters.

In 1964, the Pingtingshan Mining Affairs Bureau rescue group, in practice within the mine, conducted tests of foam ejection and mock fire extinguishing, and as a result it was proved that the high-multiplying foam has great effectiveness in mine timber fires, coal wall fires, oil fires in rooms within the mine, and single-shaft fires. Its strong point is said to be that its force is great, and within 20 to 30 minutes the force of the fire is restrained and the source of the fire extinguished, and fire-fighting personnel can promptly enter the fire area and put out the embers. This fire-extinguishing technique has already been used by rescue groups of mining affairs bureaus in such places as Pingtingshan, Fouhsin, and Fushun, and it is said that the principal present defect of this fire-fighting technique is that the set equipment is quite heavy.

All-Country Rock Dust Elimination Meeting

Above have been given technical innovations of the Chinese coal industry reported last year and this year, and some of the things in which emphasis has probably been placed in these technical innovations are prevention of coal mine disasters, lessening of the labor of workers, and preservation of health. It is noted in this regard that recently an all-country meeting was held at Wuhan concerning measures to reduce rock dust in mines. This meeting was held under the sponsorship of the Chinese Metal Association, and 120 representatives including workers, specialists, scholars, scientists, and engineers from 22 provinces and

cities of the entire country participated, and subjects were taken up such as vertical shaft ventilating equipment and its automation, purification and filtration of air, rock dust measuring equipment, and other measures for protecting the health of coal mine workers.

As was brought out in this meeting, at present in China in the fields of mechanization and automation of ventilation as well as equipment for preventing rock dust, improvements are being conducted in the various kinds of drills attached to hydrogen bomb explosion ventilating equipment and moist and dry-type dust suction equipment. Also, the filter membrane rock dust measuring technique which is the world's latest technique has been adopted. In addition, it is said that the most advanced photoelectric-type as well as electrostatic-type rock dust measuring equipment is at present being tested, and that research into electrical rock dust elimination techniques is also being advanced.

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SPEED UP IN CONSTRUCTION OF COAL MINES AND IMPROVEMENT IN COAL QUALITY

There is very little information regarding the news on coal industry of Communist China. The actual production figure has not been announced since 1959 which gave the figure of 347,800,000 tons. An overall detail report on Chinese coal industry is difficult to grasp but the fragmentary reports show that China is making a steady progress.

Construction Time of Coal Mines Reduced by About a Year

The following shows the annual production of new mines developed during 1963 and 1964.

Ch'ing-he-men shaft, Feu-hsin Coal Mine, Liaoning (600,000 tons)

Chang-hsin shaft, Chi-hsi Coal Mine, Heilungkiang (600,000 tons)

New shaft at Wen-he Coal Mine, Kirin (370,000 tons)

Pa-tao-chiang shaft, T'ung-hua Mining Affairs Bureau, Kirin (450,000 tons)

Chin-hua-shan shaft, T'ung-ch'uan Mining Affairs Bureau, Shensi (450,000 tons)

Fan-ko-chuang shaft, K'ai-le Coal Mine, Hopeh (1,800,000 tons)

Wu-yang shaft, Lu-an Coal Mine, Shansi (900,000 tons)

Chin-ch'eng-wang-t'ai-p'u shaft, Ch'in-shui Coal Field, Shansi (450,000 tons)

Incline shaft, Ta-t'ung Yung-ting-chuang Coal Mine, Shansi (1,500,000 tons)

Shaft, Hsuan-le Mining Affairs Bureau, Henan (300,000 tons)

No.10 shaft, P'ing-ting-shan Coal Mine, Henan (1,200,000 tons)

Shaft, He-pi Ta-hu Coal Mine, Henan (750,000 tons)

Shaft, Shao-wu Coal Mine, Fukien (210,000 tons)

Yang-ch'ang Coal Mine, Yunnan (being constructed)

Over 10 new mines began operating during 1963 and 1964, but the most significant developments are the use of modern mining construction techniques and the shortening of construction time. The NCNA report from T'ai-yuan of 16 June stated that the construction time through use of modern techniques has been reduced by about a year compared to the time required prior to 1963. In general, a large scale mine requires four years (previously 5 years) and a medium size mine requires two years (previously over three years) to build. It is said that 16 new shafts scheduled to be built by 1966 will be put into operation during 1965.

Needless to say, the economic effect derived from the shortened construction time is great. The Ministry of Coal Industry of Communist China calculates that if a construction of a mine is reduced by a year a coal mine with an annual production of 900,000 tons will save an investment of 2,000,000 yuan, cut down 300,000 working days and will have an additional coal of 500,000 tons.

Construction Method Developed at Ching-hsi Coal Mine in Peiping

A new method was first applied during the construction of Hsi-shan-shui shaft at the Ching-hsi Coal Mine in Peiping. In June 1963, the State Planning Commission and the State Economic Commission carried out a systematic work at the mine with the mine construction workers of the seven industries

including coal mining, metallurgy, construction and railroads and decided to popularize the method. This new method became nationally known as the "faster, better and wasteless" method of constructing mines.

This mine shaft construction method utilizes experiences used in 16 operations for construction of shaft and high speed digging and is referred to as a "wet rock cutting, high speed digging and speedy shaft building" method. The method in general is as follows. About 7 or 8 air drills operate simultaneously on wall surfaces and a whole section is blasted at one blast. These air drills are equipped with legs and water nozzles. The legs support the weight of the drill which can be operated by one man. In the past, each drill required three men to operate. Water ejects when the drill is in operation. The water absorbs the rock powder which keeps the air clean and prevents the powder from flying around. Normally, six different processes are involved but the new method accomplishes these in one operation. In the case of Ching-hsi Coal Mine, the tempo of construction just about doubled and the cost per meter was reduced by 200 yuan (about 30,000 yen). During the three years of drilling operation, not one silicosis patient appeared.

Digging 300 Meters in One Month

The speed of shaft construction at various coal mines increased since the new method was adopted two years ago. Prior to 1963, there were only six corps in the entire China which were able to dig over 100 meters through rocks, but as of April 1965, there are 162 corps capable of digging through

100 to over 200 meters in one month. The two Ch'en-chia-fen corps despatched by Ching-hsi Coal Mine to assist in the construction of Ta-t'ung Coal Mine established a record of 351.1 meters during the month of May. This new construction method not only speed up the progress but improves the quality of work. Recently the Ministry of Coal Industry inspected the 179,000 meters of newly developed rock shafts and testified that all meet the national standard specifications.

Furthermore, this construction method can be applied also in iron ores, non-ferrous metals, lime stone, asbestos, graphite and mica mines. It can also be used in railroad tunnels, basic work on large dams, sewage systems and subway systems. It is said that 29 digging crews of K'eng-tao Tsung Kung-ssu of the Ministry of Metallurgical Industry speeded up the operation by 15- 50% during January to May 1965.

Improvement of Coal at Ta-t'ung Coal Mine

An effort to improve the quality of coals has been noted in line with the technical progress made in the basic construction of mines. A noteworthy example is the Ta-t'ung Coal Mine in Shansi Province.

The Ta-t'ung Coal Mine located near the northern border of Shansi Province is a representative coal mine of China with a total area of 2200 km^2 and a reserve of over 40,000,000,000 tons. It serves as a base for motive power of Pao-t'ou Steel Combine and T'ai-yuan heavy industry region and supplies coals to 23 provinces and cities. There are over 2300 industrial production units using coals from Ta-t'ung. Refuse rate of Ta-t'ung coal being transported out daily is less than 0.5% and the ash

content does not exceed 10%. No effort was made in improving the quality of the Ta-t'ung coal because of its superior grade.

However, the sales department of the Mining Affairs Bureau of the Ta-t'ung Mine despatched an investigation team to various consumers to seek out the views of these consumers of the coal. A thorough check at Anshan Steel Company and the Ta-lien Port Authority showed defects of the coal which have not been detected before. For example, the Anshan Steel's power plant and coal gas furnace utilize uniform size coal; therefore, large clumps and small size coal from Ta-t'ung were either broken up or shifted before being used. The cadres at the plant stated that a daily manpower of 180 was required just to sort the coals. The Ta-lien Port Authority had similar problems. The investigation team calculated that the purchasing and transporting cost of coals to Anshan Steel alone amounted to 10,000 yuan each month.

When the above became known, the cadres of Mining Affairs Bureau appealed to all workers to improve the quality.

First of all, they studied the problem of varying size and found that many of the coal dressing facilities were too crude. Through technical reform, coal dressing was improved and the operation method was also improved.

The workers' sense of responsibilty strengthened when they became aware of the important significance in quality improvement. Miners at Chin-hua-kung and K'ung-chin-wan mine shafts which produce relatively

good quality coal are carrying out the work of trying to eliminate all refuse. Any member finding refuse in coal trucks for delivery will stop delivery. These workers are saying that it is better to spend more time at the mine than to cause inconvenience to the consumers.

Recently, several mine shafts ~~had~~ coal seam shifted which caused higher content of ashes and refuse. A research was conducted. A method of drilling many holes and using less explosives to prevent breaking of rocks was used. In this manner, coal can be taken out and the rocks can be removed separately.

An inspection method has been improved. Coal being transported must pass through six teams of inspections. Coals are not released until the National specifications are met.

Since the above measures have been taken, the coals at Ta-t'ung Mine have reduced the average ash content to 8.68% and the refuse rate to 0.3%.

Quality and Quantity Problems Resolved at Coal Dressing Plant at Pen-hsi Ts'ai-t'un Coal Mine

The Pen-hsi Ts'ai-t'un Coal Mine in Liaoning Province achieved great ~~great~~ result in the reduction of ash content and also increased the production of "clean" coal. This clean coal is a heavy coking coal being supplied to Anshan Steel Company and to Pen-hsi Steel Company.

However, a loss of clean coal was inevitable in the process of lowering the ash content. The Coal Dressing Plant calculates that for each

percent reduction of ash content an eight to ten percent loss of clean coal is inevitable and this was considered a "general rule." However, the State requested that the ash content be reduced further from 12.5% of 1964 to 11.5%, which according to the "general rule", a broader reduction of clean coal recovery must be expected. In other words, a recovery rate of 88.4% attained in 1964 would be lowered to 55.3%. The higher echelon realized this. The quality of coal would surely improve but must expect a loss of 140,000 tons of clean coal.

It was decided to resolve the problem of quality or volume. It was discovered that as the quality of coal improved the ratio of slurry almost doubled which means that a large quantity of clean coal became mixed with slurry. Therefore, recovery of clean coal from slurry would improve the recovery rate. When this became known, a new method of flotation system was experimented. It was discovered that a repetition of three flotation cleaning instead of one made possible to recover over 20 tons of clean coal from slurry a day. This improved the recovery rate by 3%. It was also discovered that defective facilities affected the quality and volume of coal. A complete investigation was made and over 200 defects were corrected.

Thus, the contradiction of "improving quality and losing quantity" was resolved. Coals transported to user during April to June of 1965 had less ash content than the State called for. During the same period, the recovery of 18,200 tons of clean coal was greater than anticipated

and the ash content was 0.2% less than the plan called for. The rate of recovery was 10% greater than the plan.

Record of Digging 2.456 Ton Per Day Per Man

During the first quarter of 1965, the Shih-ke-chieh Coal Mine in Shansi Province produced an average of 1.876 ton per man per day, but the daily average was raised to 2.456 tons in April and has been maintaining top level nationally since. This amazing record was obtained through analytical comparison of production process and improve the area where improvement was needed. Technical reforms in 21 items including automatic taxiing system and mechanization of car pusher were made and 180 men formerly engaged in these work have been transferred to other types of work.